REMARKS

Claims 1, 3-12, 14-16, 19, 21-34 and 36-41 were pending in the application.

Claim 1 has been amended to specify that the passage includes at least one spiral portion which spirals in a first spiral direction and at least one further portion which spirals in a second spiral direction opposite to the first spiral direction and that a cavity is provided between the two spiral portions. Basis for this amendment can be found in claims 23 and 24 as originally filed.

Claims 14, 16, 21, 22, 27, 32, 38 and 40 have been amended in conformity with the amendments to claim 1.

Claim 19 has been amended to specify that the flow control insert has a central column and that the spiral portions of the passage spiral around the central column. Basis for this amendment can be found on page 16, lines 1 to 8, which describes the body members 30, 40 having a central column with a spiral protrusion extending therefrom, and that the spiral passage is formed between the surfaces of the spiral protusion, the central column and the casing.

Claims 29 and 43 have also been amended to include the features of original claims 23 and 24. In claim 43, the requirement for an axial portion at each of the ends of the spiral portion has been removed. Basis for this amendment can be found in claim 1 as originally filed, which did not have a requirement for two axial ends.

Claims 31 and 44 have been amended to incorporate the features of original claim 23.

Claims 23, 24, 26 and 37 have been cancelled.

No new matter has been added.

35 USC 102 Rejections in view of Metz (US 4,083,406)

Claims 1, 3-5, 11, 12, 14-16, 25, 26, 28, 31-34, 36, 39, 43 and 44 were rejected under 35 USC 102(b) as being anticipated by Metz. In light of the amendments, Applicant traverses this rejection.

Claim 1 has been amended to specify that the passage includes at least one spiral portion which spirals in a first spiral direction and at least one further portion which spirals in a second spiral direction opposite to the first spiral direction and that a cavity is provided between the two spiral portions.

In contrast, Metz's spiral portion (mixing screw 28) does not include two oppositely directed spiral portions with a cavity therebetween. In contrast, Metz's mixing screw 28 spirals in a single direction only.

Accordingly, amended claim 1 is novel over Metz because it includes the features of the first and second spiral portions and the cavity between them.

Furthermore, responding to the Examiner's comments, in the Examiner's analysis of former claim 1, the Examiner identifies Metz's mixing screw 28 as being both the flow control insert and the shoe of claim 1. However, the current claim 1 (and claim 1 as previously presented) specifies that the flow control insert is adapted to be inserted within the downhole string *above the shoe*.

Applicant respectfully points out that a shoe in oil well terms is a very specific piece of equipment. The US Department of Labor (glossary extract enclosed) defines a guide shoe as: "a short, heavy, cylindrical section of steel filled with concrete and rounded at the bottom, which is placed at the end of the casing string. It prevents the casing from snagging on irregularities in the borehole as it is lowered". Hence, it is clear that Metz's internal mixing screw 28 is not a shoe according to this definition.

Secondly, according to the Examiner's logic, the flow control insert cannot be located above the shoe, as required by claim 1, if the flow control insert and the shoe are <u>both the mixing screw 28.</u> The mixing screw 28 cannot be located above itself.

Thus, for all the foregoing reasons, amended claim 1 is not anticipated by Metz. Accordingly, the rejection based on 35 USC 102 is most respectfully thereby traversed.

<u>35 USC 103: Rejection: Metz (US 4,083,406) in view of Brockman (US 6,311,774)</u>

Claims 23, 24, 27, 37 and 40 were rejected under 35 USC 103(a) as being unpatentable over Metz in view of Brockman (US 6,311,774). Applicant respectfully submits that amended claim 1 is non-obvious over Metz, even in view of Brockman, for the following reasons.

Claim 1 has now been amended to incorporate the features of previous claims 23 and 24. Hence, claim 1 now specifies that the passage of the flow control insert includes at least one spiral portion which spirals in a first spiral direction and at least one further portion which spirals in a second spiral direction opposite to the first spiral direction and that a cavity is provided between the two spiral portions.

The Examiner specifically pointed to Brockman (Fig 7) as disclosing a first spiral section 72 and a second opposite spiral section 74 with a space in between. However, Applicant respectfully submits that Brockman is irrelevant to the present invention for the following reasons:

Claim 1 requires a flow control insert for location within a downhole string, the flow control insert comprising a passage with two oppositely directed spiral passage portions with a cavity therebetween. However, Brockman's spiral portions 72, 74 are not on a flow control insert located within a downhole string. In complete contrast, Brockman's spiral portions 72, 74 are on the <u>exterior of the well casing</u>. This can be understood by referring to column 3, lines 38 to 44, Fig. 2 and Fig. 7. Column 3, lines 38 to 44 reads:

> "Referring to Fig. 7, in an alternative isolation section 70, the fin 31 may be replaced by opposing helical fins 72 and 74 which are located near opposite ends of the isolation section 70 and compact the wet cement in the region between the fins 72 and 74. Among other advantages, the compaction of the cement removes air pockets to provide a better adhesive bond".

(Note: "fin 31" seems to be an error and should read "fin 39").

Referring to Fig. 2 and column 2, lines 49 to 51, the fin 39 is described as being around the exterior of the casing 21. Hence, this means that also in Fig. 7, the replacement fins 72, 74 are also on the outside of the well casing, between the well casing and the borehole wall.

Metz requires a spiral portion on an insert inside the casing string 16, whereas Brockman does not disclose any spiral portions inside the casing string and, instead, has spiral fins outside the casing, in the annulus between the casing string and the borehole wall. Hence, reading Metz together with Brockman, there is no hint or suggestion to modify Metz's internal spiral insert to provide a second oppositely directed spiral portion <u>inside the casing string.</u>

Therefore, even reading Metz in combination with Brockman does not lead the skilled person to the claimed arrangement of a flow control <u>insert</u> for insertion within a downhole string that includes two oppositely directed spiral passage portions. Metz fails to disclose two oppositely directed spiral passage portions, whereas Brockman fails to disclose two such portions as part of an insert. Brockman only discloses exterior fins. Thus, a skilled person reading Metz in combination with Brockman would still be unable to reproduce the claimed feature of the two opposite spirals within the downhole string. Accordingly, the rejection under 35 USC 103 of claims 23, 24, 27, 37 and 40 is, therefore, traversed.

Furthermore, column 3, lines 38 to 44 explains that Brockman's helical fins are located at opposite ends of the isolation section 70 and compact the wet cement in the region between the fins 72, 74. Cement from the left hand side meets cement from the right hand side in the region 70, where it gets compacted. Hence, Brockman involves two different streams of cement, travelling from different directions towards each other. This is not even possible in the context of the present invention or in Metz, because in both cases the flow direction can only be from the top to the bottom. In Metz, it is not possible to initiate a second flow <u>inside the downhole string</u>, travelling upwards against gravity via a second spiral portion to meet the first flow inside the downhole string. Therefore, a skilled person thinking about modifying Metz would not consider that the Brockman arrangement was compatible with the Metz system.

Furthermore, the Examiner stated that it would have been obvious to include opposing spiral portions to provide a better fluid mixing in Metz, due to the teachings of Brockman.

Brockman also fails to explicitly teach that two, differently orientated spiral fins promotes mixing (mixing being irrelevant in Brockman since both substances are cement). Both Metz and Brockman fail to teach passing fluid through a first set of fins having a first spiral direction and then passing the same fluid through a second set of fins having a second spiral direction. Metz's cartridge is located at the bottom of a casing, and fluid flows down the spiral, in one spiral direction, from the top to the bottom. Brockman is using two different streams of cement from different directions. Each stream of cement passes through one of the two spirals, NOT through both of them sequentially. Thus, Brockman fails to teach selecting the orientation of the fins in order to sequentially feed a single stream of fluid in a first spiral direction and then into a second opposite spiral direction. Brockman merely teaches that the orientation of the exterior fins determines the direction of cement flow in the annulus around the casing.

Thus, in contrast to the present invention, neither Metz nor Brockman teaches that a single stream of fluid should flow in a first spiral direction and then in a second spiral direction. Hence, even combining Metz and Brockman together <u>could not</u> result in a single stream of fluids flowing sequentially in opposite spiral directions, as required by amended method claim 31.

A technical advantage of a flow control insert of amended claim 1, is that drilling mud flowing through the flow control insert is decelerated by inducing turbulence in the cavity (connection region) between the oppositely directed spiral portions of the passage (see page 12, lines 20 to 27 of the application as filed). The flow control insert, therefore, acts to decelerate fluids, in particular drilling mud.

In contrast, Metz's spiral insert is located within a cartridge. The cartridge includes reservoir chambers for a monomer and an associated mixed aggregate and for a catalyst, which are located directly on top of the spiral insert. The monomer/aggregate mixture does not need to be decelerated by the spiral insert because it is not travelling particularly fast in the first place, only having travelled the few inches from the top of the cartridge immediately above the spiral

insert, and not having fallen all the way down from the wellhead. Drilling mud cannot enter Metz's spiral insert because it cannot get into the cartridge.

Hence, deceleration of cement is irrelevant to Metz, and deceleration of drilling mud is impossible. Thus, it is obvious to the person of ordinary skill in the art that Metz's device cannot solve the problem of how to decelerate drilling mud and that there would be no benefit to Metz's device in having a second, oppositely-directed spiral portion.

In conclusion:

1) A person of ordinary skill in the art would not be tempted to modify Metz in view of Brockman, to include a second, oppositely-directed spiral passage portion, because Brockman's exterior fins cannot be combined with or have any effect on Metz's interior mixing screw 28.

2) Neither Metz nor Brockman discloses an <u>insert</u> having a passage including two oppositely directed spiral passage portions (Brockman's spiral fins being exterior to the casing), so even reading these documents together does not lead the person of ordinary skill in the art to the present invention. An insert having a passage including two oppositely directed spiral passage portions is specifically required by amended claim 1.

3) Brockman merely teaches that the orientation of the exterior fins determines the direction of cement flow in the annulus around the casing. Brockman passes each stream of cement either through one set of fins OR the other set of fins. In particular, Brockman does NOT teach passing fluid through a first set of fins having a first spiral direction and then passing the same fluid through a second set of fins having a second spiral direction. Hence, even combining Metz and Brockman together <u>could not</u> result in a single stream of fluids flowing sequentially in opposite spiral directions, as required by amended method claim 31.

4) Metz is not concerned with decelerating any other sort of fluid, and Metz's insert is not capable of even receiving drilling mud. Metz is, instead, concerned with mixing a plurality of different substances (monomer, aggregate and catalyst) together in a cartridge, ready for use.

5) Brockman is not concerned with decelerating any other sort of fluid, and is instead concerned with the transport of two different streams of cement that are travelling on the exterior of the casing string in opposite directions, and compacting these two different streams together when they collide. Brockman is also not concerned with mixing two different substances together (unlike Metz), since both of Brockman's streams are cement. Since the substances are identical, no mixing is required.

Therefore, amended claim 1 as well as claims 23, 24, 27, 37 and 40 are non-obvious over Metz, even in view of Brockman. Independent claims 29, 31, 43 and 44 all share the novel and non-obvious feature of claim 1, i.e., that the flow control insert has two oppositely directed spiral passage portions. Hence, claims 29, 31, 43 and 44 are also novel and non-obvious, for the same reasons as explained above with respect to claim 1. Reconsideration and withdrawal of the rejection is respectfully requested.

<u>35 USC 103 rejections in view of Metz (US 4,083,406), Baker (US 2,178,846) and Dillon (US 5,346,007)</u>

Claims 6-10 were rejected under 35 USC 103(a) as being unpatentable over Metz in view of Baker (US 2,178,846). Claims 19, 29, 30 and 38 were rejected under 35 USC 103(a) as being unpatentable over Metz in view of Dillon (US 5,346,007). Claims 21 and 22 were rejected under 35 USC 103(a) as being unpatentable over Metz.

Claims 3-12, 14-16, 19, 21-22, 25, 27-34, 36, 38-41, 43 and 44 are all dependent on one of the abovementioned independent claims. Hence, these claims are also novel and non-obvious, at least by virtue of their dependencies. As such, the Examiner's rejection of claims 6-10, 19, 21, 22, 29, 30 and 38 in view of Metz (US 4,083,406), Baker (US 2,178,846) and Dillon (US 5,346,007) is now moot. Also, the Examiner's rejection of claims 3-5, 11, 12, 14-16, 25, 26, 28, 31-34, 36, 39, 43 and 44 in view of Metz is now moot.

Request for Allowance

It is thus believed that the application is now allowable and notification to this effect is earnestly solicited. Should the Examiner have any questions or comments regarding Applicants' amendments or response, he is asked to contact Applicants' undersigned representative at (215) 988.3303. Please direct all correspondence to the below-listed address.

Respectfully submitted,

Robert Cannuscio
Registration No. 36,469
DRINKER BIDDLE & REATH LLP
Intellectual Property Group
One Logan Square
18th and Cherry Streets
Philadelphia, PA 19103-6996
Tel: (215) 988.3303
Fax: (215) 988.2757

Attachment

Glossary of Terms

A B C D E F G H I J K L M N O P R S T U V W

*This is an abridged version of the **Dictionary of Petroleum Terms** provided by Petex and the University of Texas Austin

G

gamma ray log n: a type of radioactivity well log that records natural radioactivity around the wellbore. Shales generally produce higher levels of gamma radiation and can be detected and studied with the gamma ray tool. See radioactivity well logging.

gas anchor n: a tubular, perforated device attached to the bottom of a suckerrod pump that helps to prevent gas lock. The device works on the principle that gas, being lighter than oil, rises. As well fluids enter the anchor, gas breaks out of the fluid and exits from the anchor through perforations near the top. Remaining fluids enter the pump through a mosquito bill (a tube within the anchor), which has an opening near the bottom. In this way, all or most of the gas escapes before the fluids enter the pump.

gas cap n: a free-gas phase overlying an oil zone and occurring within the same producing formation as the oil. See reservoir.

gas-cap drive n: drive energy supplied naturally (as a reservoir is produced) by the expansion of the gas cap. In such a drive, the gas cap expands to force oil into the well and to the surface. See reservoir drive mechanism.

gas-cut mud n: a drilling mud that contains entrained formation gas, giving the mud a characteristically fluffy texture. Gas cut mud may cause a lowering of mud weight.

gas drive n: the use of the energy that arises from the expansion of compressed gas in a reservoir to move crude oil to a wellbore. Also called depletion drive. See dissolved-gas drive, gas-cap drive, reservoir drive mechanism.

gas injection n: the injection of gas into a reservoir to maintain formation pressure by gas drive and to reduce the rate of decline of the original reservoir drive. One type of gas injection uses gas that does not mix (is not miscible) with the oil. Examples of these gases include natural gas, nitrogen, and flue gas. Another type uses gas that does mix (is miscible) with the oil. The gas may be naturally miscible or become miscible under high pressure. Examples of miscible gases include propane, methane enriched with other light hydrocarbons, methane under high pressure, and carbon dioxide under pressure. Frequently, water is also injected in alternating steps with the gas.

gas injection well n: a well into which gas is injected for the purpose of maintaining or supplementing pressure in an oil reservoir.

gasket n: any material (such as paper, cork, asbestos, stainless steel or other types of metal, or rubber) used to seal two essentially stationary surfaces.

gas lift n: the process of raising or lifting fluid from a well by injecting gas down the well through tubing or through the tubing-casing annulus. Injected gas aerates the fluid to make it exert less pressure than the formation does; the resulting higher formation pressure forces the fluid out of the wellbore. Gas may be injected continuously or intermittently, depending on the producing characteristics of the well and the arrangement of the gas-lift equipment.

gas-lift mandrel n: a device installed in the tubing string of a gas-lift well onto which or into which a gas-lift valve is fitted. There are two common types of mandrel. In the conventional gas-lift mandrel, the gas-lift valve is installed as the tubing is placed in the well. Thus, to replace or repair the valve, the tubing string must be pulled. In the sidepocket mandrel, however, the valve is installed and removed by wireline while the mandrel is still in the well, eliminating the need to pull the tubing to repair or replace the valve.

gas-lift valve n: a device installed on a gas-lift mandrel, which in turn is put on the tubing string of a gas-lift well. Tubing and casing pressures cause the valve to open and close, thus allowing gas to be injected into the fluid in the tubing to cause the fluid to rise to the surface. See gas-lift mandrel.

gas-lift well n: a well in which reservoir fluids are artificially lifted by the injection of gas.

gas lock n: 1. a condition sometimes encountered in a pumping well when dissolved gas, released from solution during the upstroke of the plunger, appears as free gas between the valves. If the gas pressure is sufficient, the standing valve is locked shut, and no fluid enters the tubing. 2. a device fitted to the gauging hatch on a pressure tank that enables manual dipping and sampling without loss of vapor. 3. a condition that can occur when gas-cut mud is circulated by the mud pump. The gas breaks out of the mud, expands, and works against the operation of the piston and valves.

gas well n: a well that primarily produces gas. Legal definitions vary among the states.

gear reducer n: see speed reducer.

gel n: a semisolid, jellylike state assumed by some colloidal dispersions at rest.

geologist n: a scientist who gathers and interprets data pertaining to the formations of the earth's crust.

Geronimo n: see safety slide.

go in the hole v: to lower the drill stem, the tubing, the casing, or the sucker rods into the wellbore.

gone to water adj: pertaining to a well in which production of oil has decreased and production of water has increased (for example, "the well has gone to water").

gooseneck n: the curved connection between the rotary hose and the swivel. See swivel.

gravel n: sand or glass beads of uniform size and roundness used in gravel packing.

gravel packing n: a method of well completion in which a slotted or perforated liner, often wire-wrapped, is placed in the well and surrounded by gravel. If open hole, the well is sometimes enlarged by underreaming at the point where the gravel is packed. The mass of gravel excludes sand from the wellbore but allows continued production.

guide shoe n: 1. a short, heavy, cylindrical section of steel filled with concrete and rounded at the

bottom, which is placed at the end of the casing string. It prevents the casing from snagging on irregularities in the borehole as it is lowered.

guy line anchor n: a buried weight or anchor to which a guy line is attached.

guy wire n: a rope or cable used to steady a mast or pole.

TOP

Occupational Safety & Health Administrations
200 Constitution Avenue, NW
Washington, DC 20210

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